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PLATE II.

- Fig. 1. Right half of abdomen, showing the position of spiracles in *Pleocoma*.
 Fig. 2. Diagram in transverse section showing the relation of spiracle to adjacent parts.
 Fig. 3. Anterior and posterior tibiæ of *P. fimbriata*.
 Fig. 4. Lateral view of head of *P. hirticollis*, the mouth parts removed.
 Fig. 5. Front view of clypeus and labrum.
 Fig. 6. Head beneath, showing the relation of parts, the maxillæ are not so plainly visible in nature.
 Fig. 7. Mandibles as seen from beneath *in situ*.
 Fig. 8. Right mandible as seen from side.
 Fig. 9. Right mandible (more enlarged) as seen from the upper side.
 Fig. 10. Left maxilla, the side adjacent to mentum.
 Fig. 11. same the side adjacent to mandible.
 Fig. 12. Right maxilla *a* lower side, *b* upper side of *Bradycinetus ferrugineus*.
 Fig. 13. Mentum and ligula of same.
 Fig. 14. Mandible of same.
 Fig. 15. Maxilla of *Aphodius erraticus* (after Duval).
 Fig. 16. Mentum and ligula of same (after Duval).
 Fig. 17. Form of maxilla of larva of *Pleocoma* from a sketch of the cast skin.
 Fig. 18. Mentum and ligula of same.



Descriptions of the larvæ of *Glyptus*, *Platypsylla* and *Polyphylla*.

BY GEORGE H. HORN, M.D.

The larvæ of Coleoptera will doubtless yield facts of taxonomic value, and may aid in settling disputed relationships among the imagines. Some attempts have already been made in this direction, notably by Erichson and others among the Scarabæidæ, and more recently by Rey in Elateridæ. Some families have yielded very little, from the fact that the species have almost the same mode of life as Cerambycidæ, Buprestidæ, and the majority of the Rhynchophora.

At present too little attention seems to be paid to study of this sort, and every student of classification should consider it a duty to describe any authentic larva known to him with such figures of form and detail as may be useful hereafter.

Recently three larvæ have come into my possession, two of which are entirely new, the third merely showing the almost absolute identity of our form with that of European species, and in accordance with the idea above explained the following descriptions are given with figures and details on the accompanying plate.

***Glyptus sculptilis* Brullé.**

During a visit to the Museum of Comparative Zoology at Cambridge in the summer of 1887, Dr. Hagen showed me some larvæ from the west coast of Africa with the following history :

About fifty years ago Dr. Savage, in company with Dr. Perkins, was engaged in missionary work in Sierra Leone. On their return they brought many objects of natural history, among them some insects, which received attention from Dr. T. W. Harris. A specimen of *Glyptus sculptilis* in the lot came finally into the possession of Dr. LeConte, and is now in his cabinet. This insect, it is well known, lives in the nests of the great white ant of that region.

From the nests of that ant Dr. Savage obtained queens, some of very great size, and in the same bottles were smaller objects supposed to be small queens of the same. When the collection reached Cambridge, from Salem, Dr. Hagen at once recognized the fact that these smaller specimens were not queen ants, but larvæ unknown to him.

When these larvæ were shown to me it was at once seen that they were Carabide larvæ. The fact that *Glyptus* was known to occur with these ants was made known to Dr. Hagen who has searched the literature with great care for any mention of the larva, but fruitlessly. Believing that a larva, which seems so rare, should be made known the following description is given :

FORM.—Somewhat clavate, robust, narrow in front, gradually broader to the ninth and tenth segments, then rapidly narrower. Length 1.25 inch or 32 millimetres. Pl. iii, figs. 1-2.

COLOR.—Whitish, the head pale brown.

HEAD.—Small, flat above, very convex beneath, pale brown, the gular region broadly paler. Clypeal region prolonged, arcuate, the margin slightly crenate, a few erect hairs at the sides of the front and behind the insertion of the antennæ, a few punctures at sides of the head. Pl. iii, fig. 3.

OCELLI.—Entirely absent.

ANTENNÆ.—Four-jointed, arising from a membranous base behind the base of mandibles and not much prolonged beyond the apex of the latter ; first joint stout, with moderately long stiff hairs in front ; second narrower, two-thirds as long ; third narrower and shorter ; fourth small, almost subulate, placed obliquely on the third, terminating in two bristles. Pl. iii, fig. 4.

MANDIBLES.—Stout, placed nearly vertically, strongly curved, the antero-inferior edge deeply trisulcate, the inner edge obtusely tridentate, the middle tooth longer. Pl. iii, figs. 4 and 6.

MAXILLÆ.—Short and rather stout, the basal piece or support short, semi-corneous; cardinal piece cylindrical, semi-corneous, obliquely truncate at apex and filled with membrane; the outer or palpar lobe four-jointed, the first joint longer than the others together, second and third rapidly shorter, fourth small, subulate. Inner lobe extending nearly as far as the palpar lobe, rather slender, indistinctly divided in two unequal parts. The maxillæ have a few stiff hairs on the cardinal piece. Pl. iii, fig. 5.

MENTUM.—Pentagonal in form, semi-corneous, supported on a semi-membranous extension of the gula, the ligula prolonged in a corneous joint and terminated by two bristles. Pl. iii, fig. 5.

LABIAL PALPI.—Short, two-jointed, the first joint short and stout, the terminal small and conical.

PROTHORAX.—Much broader than long, broader behind, arcuate in front, a narrow, semi-corneous space each side, behind which is a deep groove; surface with erect hairs sparsely placed, directed to the front, and a fine median groove which extends to the end of the eleventh segment.

MESO- and METATHORACIC SEGMENTS.—Similar in form, shorter than the prothorax, each with a transverse crescentic region bearing very short spines with a few longer hairs directed backwards.

ABDOMINAL SEGMENTS.—On the upper side the first six segments have a small space each side of the middle bearing very short spines.

SIDES of BODY.—Distinctly wrinkled, showing the division between the dorsal scutes, the connecting membrane and the ventral plates.

UNDERSIDE.—Flatter than the upper surface, the ventral segments 2-7 with a small mammiliform protrusion on each side bearing very short spines, the last two segments with a transverse ridge bearing longer spines.

LAST SEGMENT.—With a feebly protrusile pseudo-segment.

LEGS.—Rather short, the anterior pair stouter. Femur longer than the rest of the leg, the tibia broader at apex; tarsi bi-articulate, terminated by a single stout claw. Pl. iii, fig. 7.

SPIRACLES.—On each side nine, the first situated in the connecting membrane at the side of the mesothorax close to the anterior border. The other eight spiracles are smaller and are placed in the

dorsal plates of the first eight ventral segments, close to their junction with the connecting membrane.

From the above description and the accompanying figures it will be seen that the larva is undoubtedly that of a Carabide. It is remarkable that there is, practically, no thoroughly corneous structure in its entire surface, except the head. The absence of ocelli is accounted for by its subterranean life.

While there is possibly room for discussion as to whether this is really the larva of *Glyptus* there is in my own mind no doubt; first from the collateral evidence already given, and, secondly the mandibles of the larva are a very close reproduction of those of the perfect insect.

The Museum of Comparative Zoology possesses quite a number of these larvæ and Dr. Perkins, who is now living, states that they were dug from the nests as stated in the label, which he identified as in the handwriting of Dr. Savage.

***Polyphylla decemlineata* Say.**

FORM of the usual Scarabæide type,—soft, flat, whitish, the caudal extremity recurved beneath. Pl. iii, fig. 8.

HEAD brownish, broader than long, convex, slightly scabrous. Pl. iii, figs. 9–10.

LABRUM short, crescentic, anterior border arcuate.

MANDIBLES stout, curved, slightly curved downward, the apex chisel shaped, slightly sinuous, with a slight notch internally.

MENTUM short, crescentic, the anterior outline oval, its face hairy, the apex with larger ciliæ, the peduncle of the gula also oval in front. Labial palpi two-jointed, arising in a transverse groove behind the apex of the mentum, the joints equal in length. Pl. iii, figs. 13–14.

MAXILLÆ large, arising on each side of the base of the mentum, the two lobes united, except a slight fissure at apex, the internal lobe with three spiniform teeth at apex, the inner side with stiff spiniform hairs, the outer lobe with spines at apex. Pl. iii, fig. 12.

MAXILLARY PALPI four-jointed, the first joint very short, second longest, third half as long, the fourth two-thirds, the entire palpus projecting but little beyond the maxilla.

ANTENNÆ four-jointed, arising from a tubercle at the front angle of the head behind the base of the mandible. First joint stouter, broader to tip, second longer and more slender, third a little longer

than half the second, the lower apical angle prolonged in a point beneath the fourth joint, last joint oval, acute, shorter than the third.

THORACIC SEGMENTS short, each with two dorsal plications.

ABDOMINAL SEGMENTS from the first to fifth formed of three plicæ, one of which is narrower on the dorsum and pyriform in outline beneath, the other two cuneiform, broader on the dorsum and gradually more acute beneath. At the ventral end of the larger are somewhat oval folds, in which the stigmata are placed. Last three segments quite smooth, not plicate, the terminal segment divided into two unequal parts by a distinct suture, and near the apex a deep arcuate impression separating a pseudo-pygidium. Anal opening transverse.

LEGS widely separated at base, the posterior pair longer, hairy above and with spinous hairs beneath. Pl. iii, figs. 15-16.

COXÆ long and rather slender, supporting a trochanter, the femur short and stout, the tibiæ oval, the front tibia with a single long claw, the middle with a short claw, the posterior without claw.

STIGMATA on each side nine, the first in the prothoracic segment, the others in the lower side of oval plicæ in the first eight abdominal segments.

SURFACE.—The thoracic segments are comparatively smooth, a few indistinct scattered granules and with moderately long erect hairs. The abdominal segments 1-8 are moderately densely granulate, each granule with a very short erect hair. The last three segments of the abdomen are smooth and shining, a few scattered long hairs. The terminal segment is, however, more punctate and rugulose near the tip, the hairs more numerous. The underside of the body has scattered hairs.

LENGTH measured along the upper side of body from tip of mandibles to anal fissure 2.10 inch ; 53 mm.

This larva does not differ essentially from that of the European *Melolontha vulgaris* as figured by Ratzeburg (Forst. Insecten pl. iii, fig. 1, et seq.). As in that species the thoracic region is the wider, from this the body is gradually narrower to the fourth abdominal segment, then gradually wider to the last segment.

For the specimen described and figured I am indebted to Mr. J. J. Rivers, of Berkeley, California.

***Platypsylla castoris* Rits.**

FORM elongate-oval, equally narrowed at either extremity, about three times as long as wide, depressed. Color whitish. Length 1.6 mm. Pl. iii, figs. 17-18.

HEAD semicircular, more obtuse in front, hind angles distinct, a long seta directed outwardly arising from near the hind angles, beneath with six shorter setæ directed backward arising near the posterior border. Eyes wanting. Pl. iii, fig. 19.

ANTENNÆ four-jointed, arising under the hind angles of the head. First joint short and broad, second narrower, bearing a spiniform process at the front angle; third cylindrical, narrower; fourth very narrow, bearing two setæ at its end. The joints are capable of telescopic retraction. Pl. iii, fig. 20.

MENTUM quadrate, a little longer than wide, supported by a short peduncle of the gula; ligula not distinctly separated, but broader than the mentum, emarginate in front, the angles rounded. Labial palpi short, two-jointed, inserted at the side of mentum at the probable point of separation in the ligula.

MAXILLÆ flattened, pyriform, rapidly narrowing at apical third, terminating in a narrow, obtuse process. Maxillary palpi short, three-jointed, arising at the sides of the maxillæ a little more than one-third from the apex. Pl. iii, fig. 19.

MANDIBLES conical, but slender and flattened, semi-corneous, arising from the sides of the buccal cavity exterior to, but a little in front of the maxillæ, slightly overlapping the apices of the latter, the tips of the mandibles crossing each other in front.

THORACIC SEGMENTS gradually wider, hind angles obtuse, upper side with four long setæ, the two near the hind angles directed outwardly and backward, those each side of middle directed backward, the lateral margin bearing a short spine near the middle. Underside of each thoracic segment with six or eight moderately long setæ arising near the posterior border and directed backwards.

ABDOMINAL SEGMENTS nine. First narrower than either the metathorax or the next, and without the short spine near the side margin. Segments 2-7 similar in form, each with the short lateral spine, eighth without lateral spine, ninth rapidly narrowed, the apex obtuse. Dorsal side of segments bearing four setæ as in the thoracic segments; ventral side with four pairs of long setæ, between which

are two or three shorter ones arising close to the posterior margin of the segment and directed backwards; across the middle of each segment (except the last) a row of short spines. Anal fissure with a process each side, bisetose at apex.

LEGS short and stout, widely separated, the coxa oval, femur more or less quadrate in outline, tibia more cylindrical, terminated by a single strong claw. Anterior femur obtusely subangulate beneath. The edges of the articulations with spinules gradually shorter to the tip of tibia. Pl. iii, figs. 21-22.

SPIRACLES.—There are nine pairs of spiracles. The first pair is situated at the side of the mesosternal segment close to the anterior angle in a fold between the dorsal and ventral plates. The abdominal spiracles are in the first eight segments on the dorsal side just within the position of the short lateral spine. The last spiracle is, however, nearer the angle than the others.

The larva just described is, in form, like that of a slender Silphide, recalling also the Corylophidæ, but too little is yet known of the larvæ of many genera to which *Platypsylla* is supposed to be related to enter into any generalizations.

It is well known that no mandibles have been detected in dissections that have been made of the imago, but in the larva we have very distinct mandibles which are probably lost in the last moult of the larva to the pupa state. By comparison it will be seen that the buccal cavity is similar in outline in the larva and imago.

The maxillæ are soft in structure and give no evidence of the future form of those of the imago.

The largest of the larvæ seen is not longer than 1.6 mm. and is probably not fully grown, seeming rather disproportionate in size to the future imago. It must not be supposed that a small larva presupposes a small imago, as the larva of *Dicælus purpuratus* would never be suspected of yielding the large imago without actually raising the larva to maturity.

For great assistance in the determination of the position of the spiracles I must acknowledge my indebtedness to Prof. C. V. Riley, who has also, for some time, had this larva under consideration. By means of stained specimens and photography the entire structure has been very accurately developed.

The larvæ in Prof. Riley's hands vary in size (like my own) from 1.2 to 1.7 mm. and were obtained from a Beaver trapped by Mr. Lawrence Bruner at West Point, Neb., October, 1886.

The larvæ before me were obtained from Beavers trapped in some of the tributaries of the Colorado of Texas. The tender skin behind the ears seems to be the favorite place, the larvæ being concealed under scales of dried material, seemingly mucilaginous.

I owe these larvæ to the kindness of a friend who has recently traveled in Texas, through whose instruction the skins were so prepared that he was enabled to obtain what, at one time, seemed almost a hopeless desire.

The eggs of *Platypsylla* were also observed. They are minute objects, not fastened to the hair, as is the case with lice, but placed directly on the skin among the densest hair.

When the larva are removed from the fur and placed on a flat surface they move with the sinuous snake-like motion observed in *Staphylinide* larvæ.

The fully developed beetles have also a mode of progression decidedly *Staphylinide* in appearance.

Platypsylla seems destined to have difficulty in finding a final resting place.

Ritsema, in the beginning, referred it to the *Aphaniptera*, an indefinite aggregation of forms gradually disintegrating.

Shortly after Prof. Westwood made it the type of a totally distinct order *Achreioptera*.

During his sojourn in Europe Dr. LeConte obtained specimens, and after the study of dissections, carefully made by Rev. A. Matthews, claimed *Platypsylla* as a Coleopter of the *Clavicorn* series and placed it in relation with *Silphidæ* and *Lep tinidæ*.

My own dissections and study have not caused me to doubt in any respect the opinion of Dr. LeConte.

In the "Berlin. Zeitschr." xxx, 1886, p. 103, Kolbe, in a short paper, sees resemblances between the mouth parts of *Platypsylla* and certain *Mallophaga* (bird lice), and is disposed to unite it with the latter series.

Dr. A. S. Packard, in a review of the *Mallophaga*, considers them degraded members of the pseudo-neuropterous series.

If we combine the opinions of the last two authors we will have another position for *Platypsylla* in the *Neuroptera* (in the broad sense), an order which seems destined to be the asylum for entomological invalids of all sorts.

Platypsylla seems widely distributed. First discovered on the American Beavers in the Zoological Gardens at Amsterdam. I have

received it from the Beavers captured at the mouth of the Rhone in France. Skins of Beavers from the Hudson's Bay region have yielded specimens while others from Alaska have given both *Platyp-sylla* and *Leptinillus*. Recently the Beavers of Texas have furnished specimens.

Miscellaneous Coleopterous Studies.

BY GEORGE H. HORN, M. D.

The following pages have not been used as the means of describing isolated species merely, although several have been included. From time to time the question is often asked as to the differences between closely allied species, more especially of those genera that have not been studied as a whole. As it is not always convenient to give in detail in letters to each correspondent the information desired, several studies, based on questions asked, have been made and are here presented for the benefit of all.

ANILLUS Duval.

A. explanatus n. sp.—Pale rufotestaceous, shining. Head rather large, frontal impressions deep and broad, surface smooth. Antennæ nearly half as long as the entire body, gradually thicker externally, the joints verticillate, the second longer and stouter than the third. Thorax trapezoidal, a little wider than long, sides arcuate anteriorly, oblique behind, the margin narrowly reflexed, but more broadly near the hind angles, these nearly rectangular, slightly obtuse, median line finely impressed, the space behind the posterior transverse impression somewhat depressed and finely rugulose. Elytra abruptly wider at base than the thorax, humeral angles prominent, but obtuse; general form oval, broadest in front of middle, the sides somewhat explanate from the humeri two thirds to apex external to a deep stria bearing subocellate punctures, the margin distinctly serrate near the humeri; disc moderately convex, the striae nearly obsolete, forming an oval space at the middle of the surface, the first stria indistinctly punctured, the submarginal rather deep and with subocellate punctures; surface distinctly alutaceous near the base, smoother near the apex. Body beneath smooth. Legs slender, middle tibiae broadened at basal half. Length .08 inch; 2 mm. Pl. iii, fig. 25.

One specimen, ♀, "Alabaster Cave," California.

The species of *Anillus* now known to inhabit our fauna are as follows:

Elytra somewhat explanate at the sides, the margin serrate near the humeri.

explanatus Horn.

Elytra of regular oblong oval form, the sides not explanate, margin not serrate.